Introduction

References and Presentation at:
http://www.elinux.org/Open_tools

Introduction

- Dave Anders aka prpplague

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- Employed at Intel as part of OTC/MinnowBoard

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- Employed at Intel as part of OTC/MinnowBoard

- Creating Open Hardware Tools

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- Creating Open Hardware Tools

  - Background and History (Past)

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- Dave Anders aka prpplague

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  - Creating new tools (Present)

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- Dave Anders aka prpplague

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- Creating Open Hardware Tools

  - Background and History (Past)

  - Creating new tools (Present)

  - Challenges going forward (Future)

Open Tools History

- Open Tools in Science

Open Tools History

- Open Tools in Science
  - Experiments often require special tools

Open Tools History

- Open Tools in Science
    - Experiments often require special tools
    - New tools are shared with other scientists

Open Tools History

- Open Tools in Science

  - Experiments often require special tools

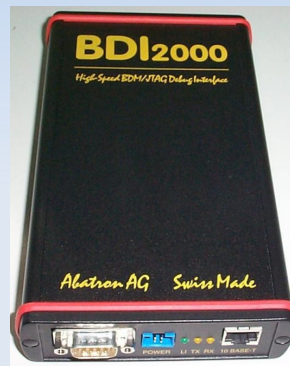 - New tools are shared with other scientists

  - Robert Bunsen - Bunsen Burner

Open Tools History

- Open Tools in Science
- Commercial Solutions

Open Tools History

- Open Tools in Science
- Commercial Solutions

Open Tools History

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- Commercial Solutions
    - Limited Operating Systems Supported

Open Tools History

- Open Tools in Science

- Commercial Solutions
    - Limited Operating Systems Supported
    - Price

Open Tools History
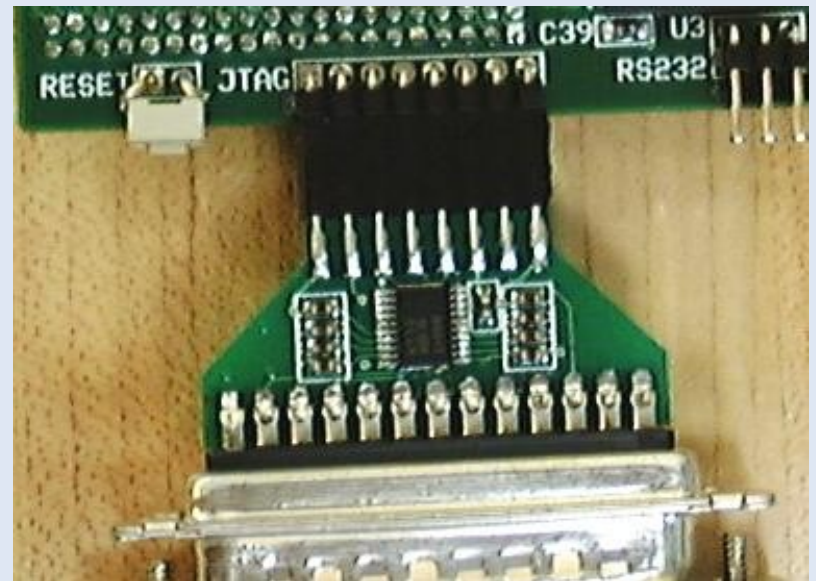
- Open Tools in Science

- Commercial Solutions
    - Limited Operating Systems Supported
    - Price
    - Features/Fixes

Open Tools History
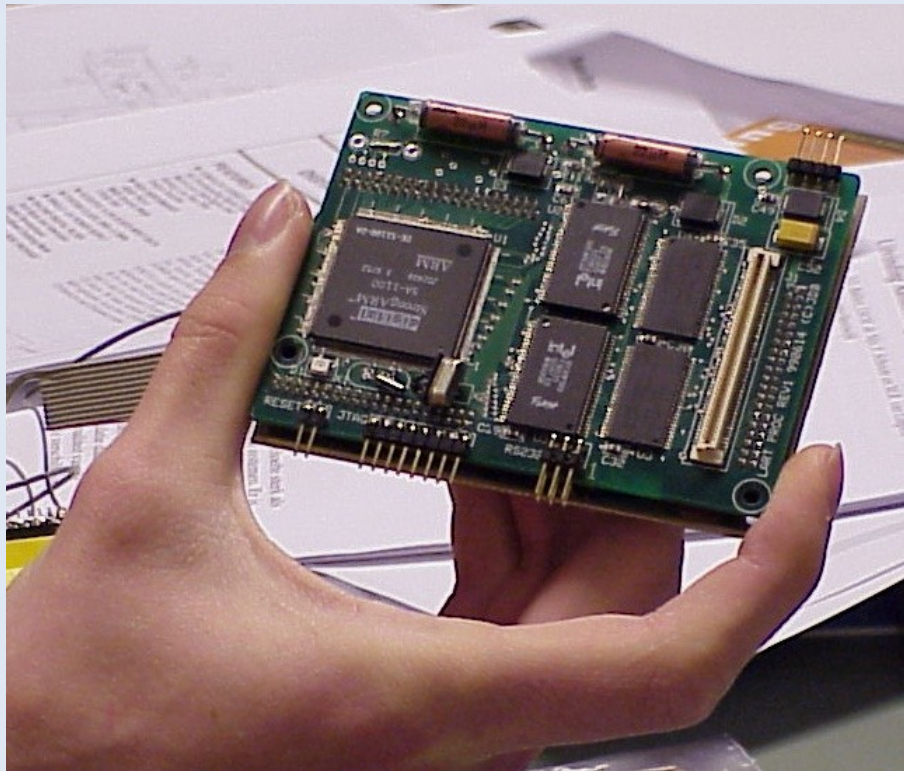
- Open Tools in Science

- Commercial Solutions

- LART Project

Open Tools History

- Open Tools in Science

- Commercial Solutions

- LART Project
  - Open Platform

Open Tools History

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  - Open Platform

  - JTAG – Holly Gates Dongle

Open Tools History

- Open Tools in Science

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  - Linux + Open Hardware + Open Tools

Open Hardware Solutions

The Maker/Hacker Community

has changed the way people

create hardware and software solutions

Open Hardware Solutions

A good multimeter used to be enough!

Open Hardware Solutions
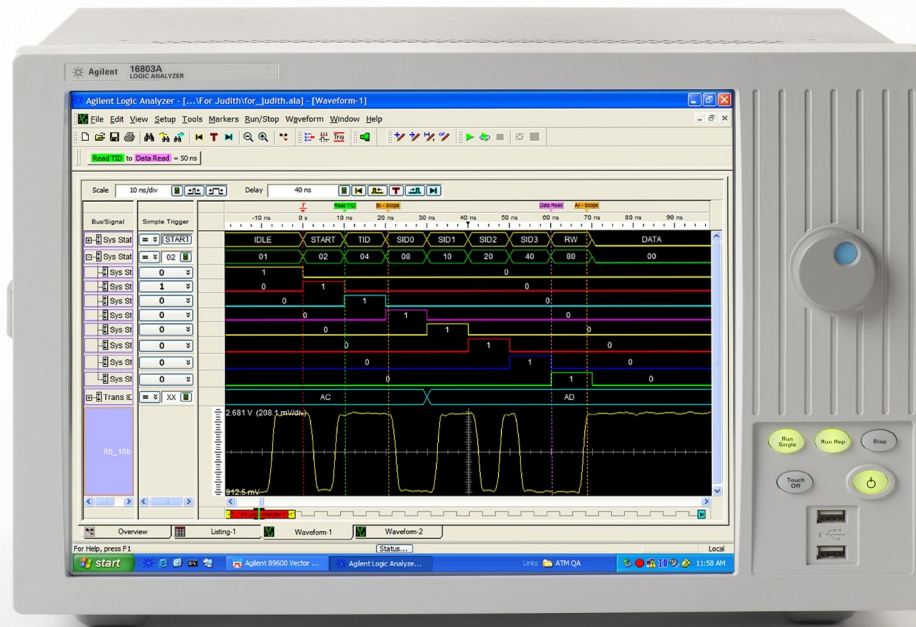
- Logic Analyzers

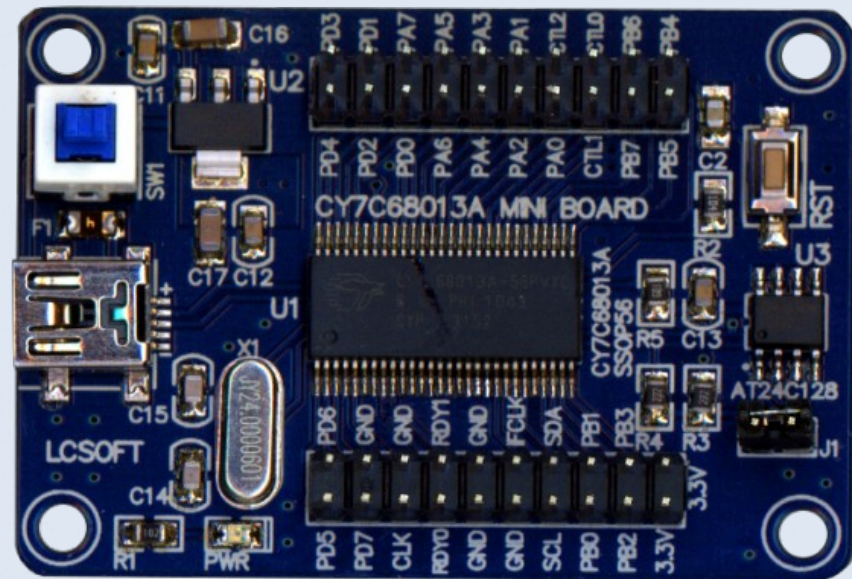# Open Hardware Solutions
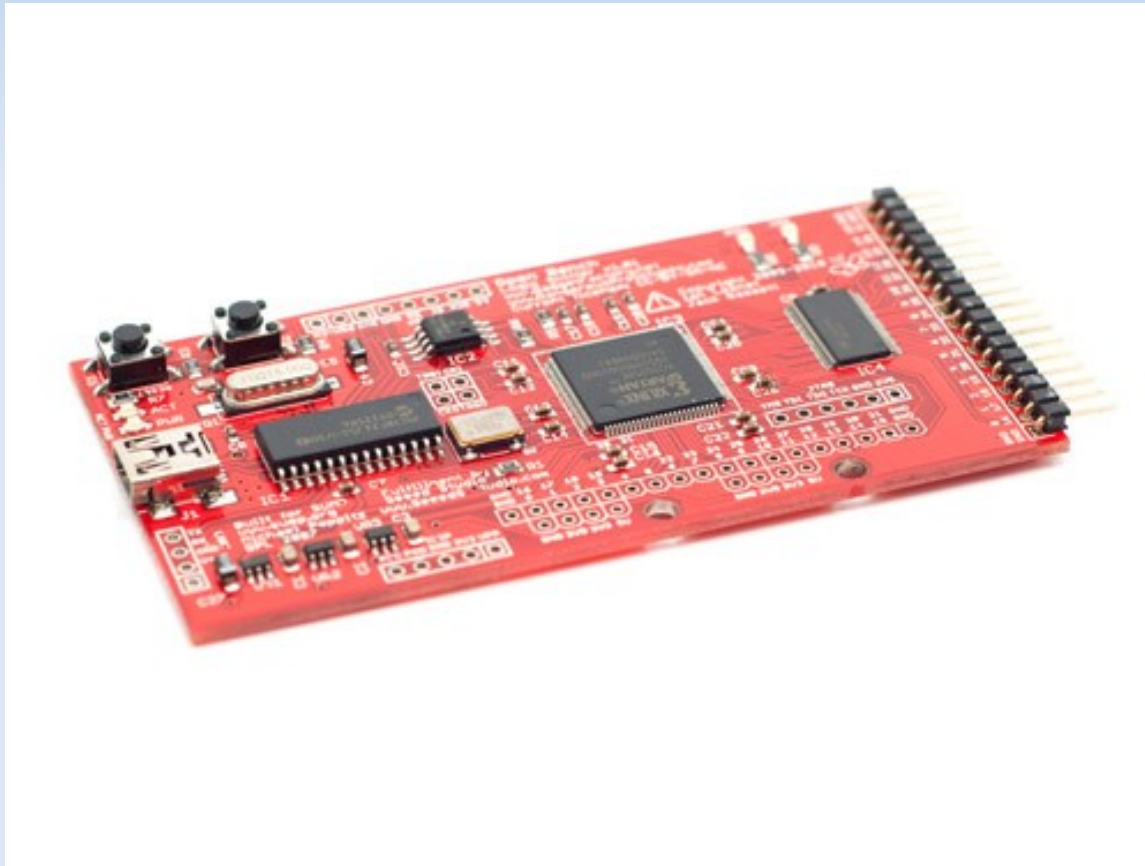
- Logic Analyzers
  - Open Workbench Logic Sniffer - FPGA

Open Hardware Solutions

- Logic Analyzers
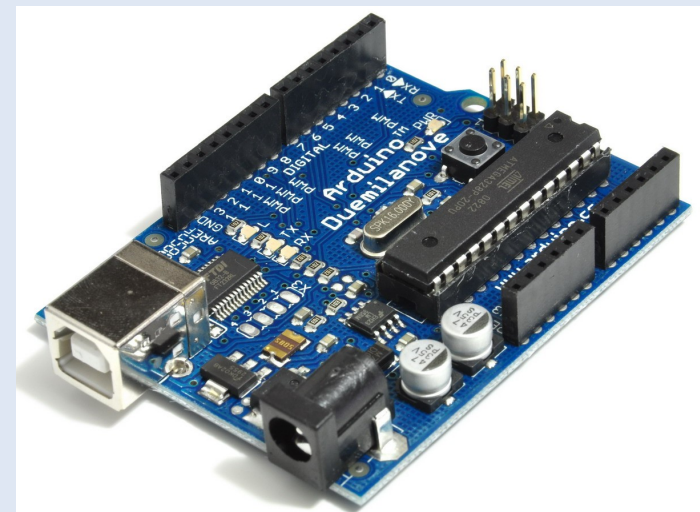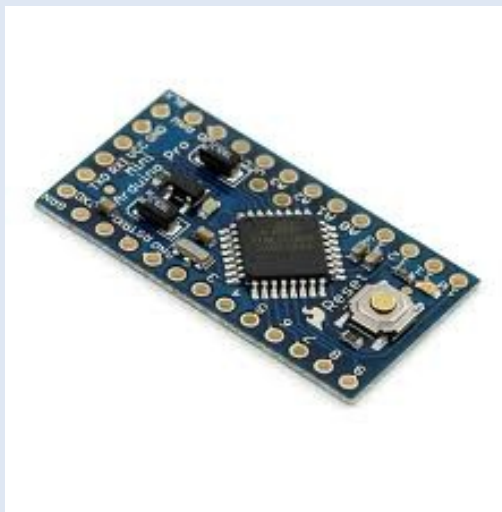 - Open Workbench Logic Sniffer - FPGA
  - Bus Pirate - PIC
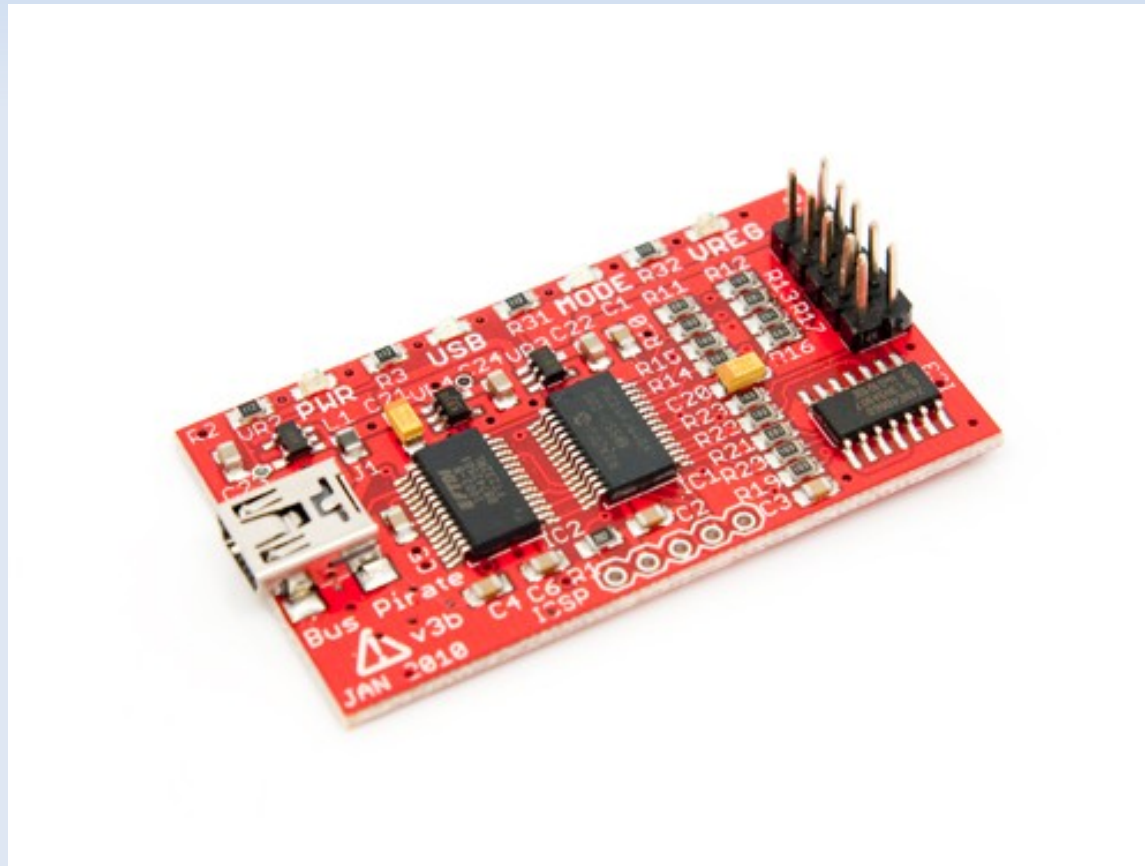
Open Hardware Solutions

- Logic Analyzers
  - Open Workbench Logic Sniffer - FPGA
  - Bus Pirate - PIC
  - Saleae Logic - Cypress FX2

Open Hardware Solutions

- Logic Analyzers

  - Open Workbench Logic Sniffer - FPGA

  - Bus Pirate - PIC

  - Saleae Logic - Cypress FX2

  - AVR/Arduino (Insert Arduino Jokes Here)

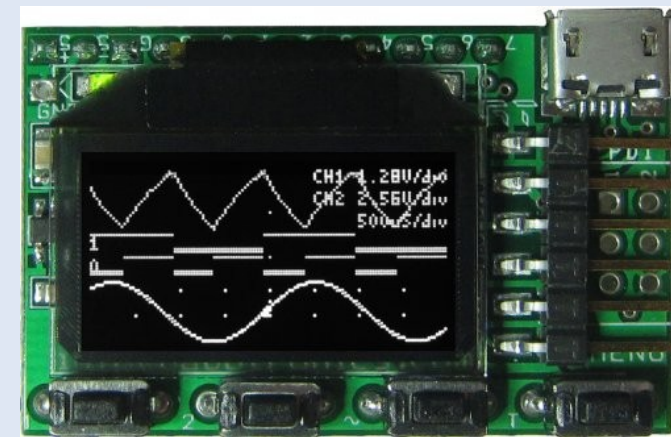# Open Hardware Solutions

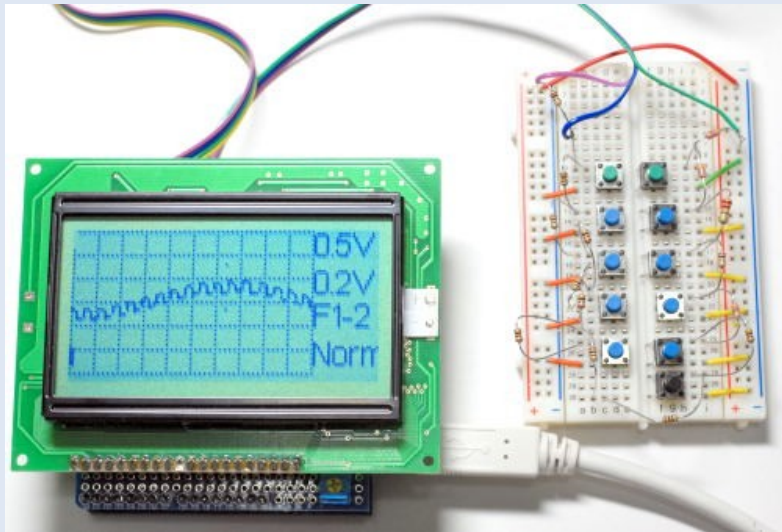- Logic Analyzers

- Oscilloscopes

Open Hardware Solutions

- Logic Analyzers
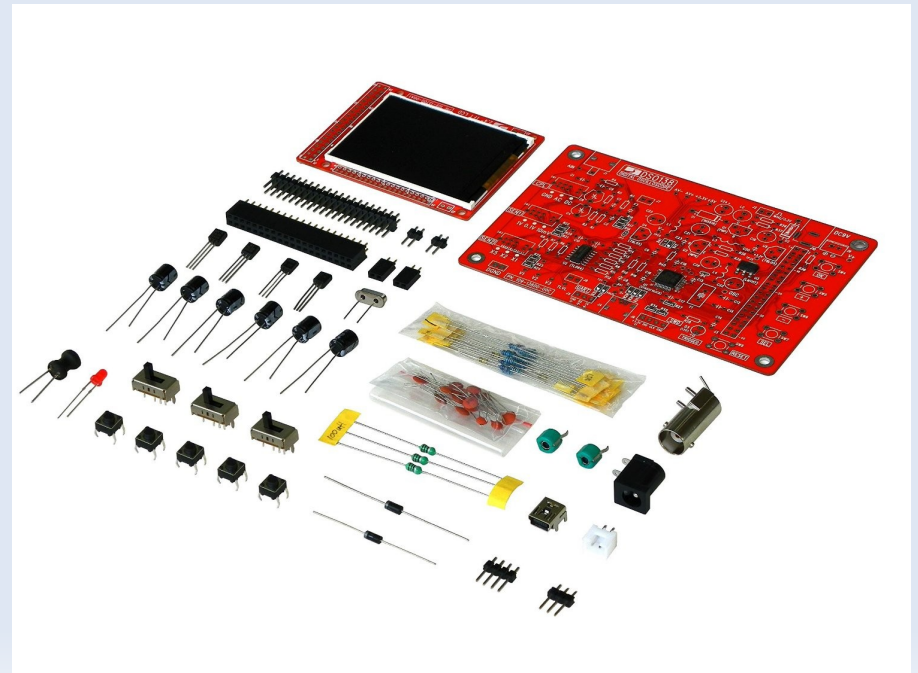- Oscilloscopes
  - Handhelds

Open Hardware Solutions

- Logic Analyzers

- Oscilloscopes

  - Handhelds

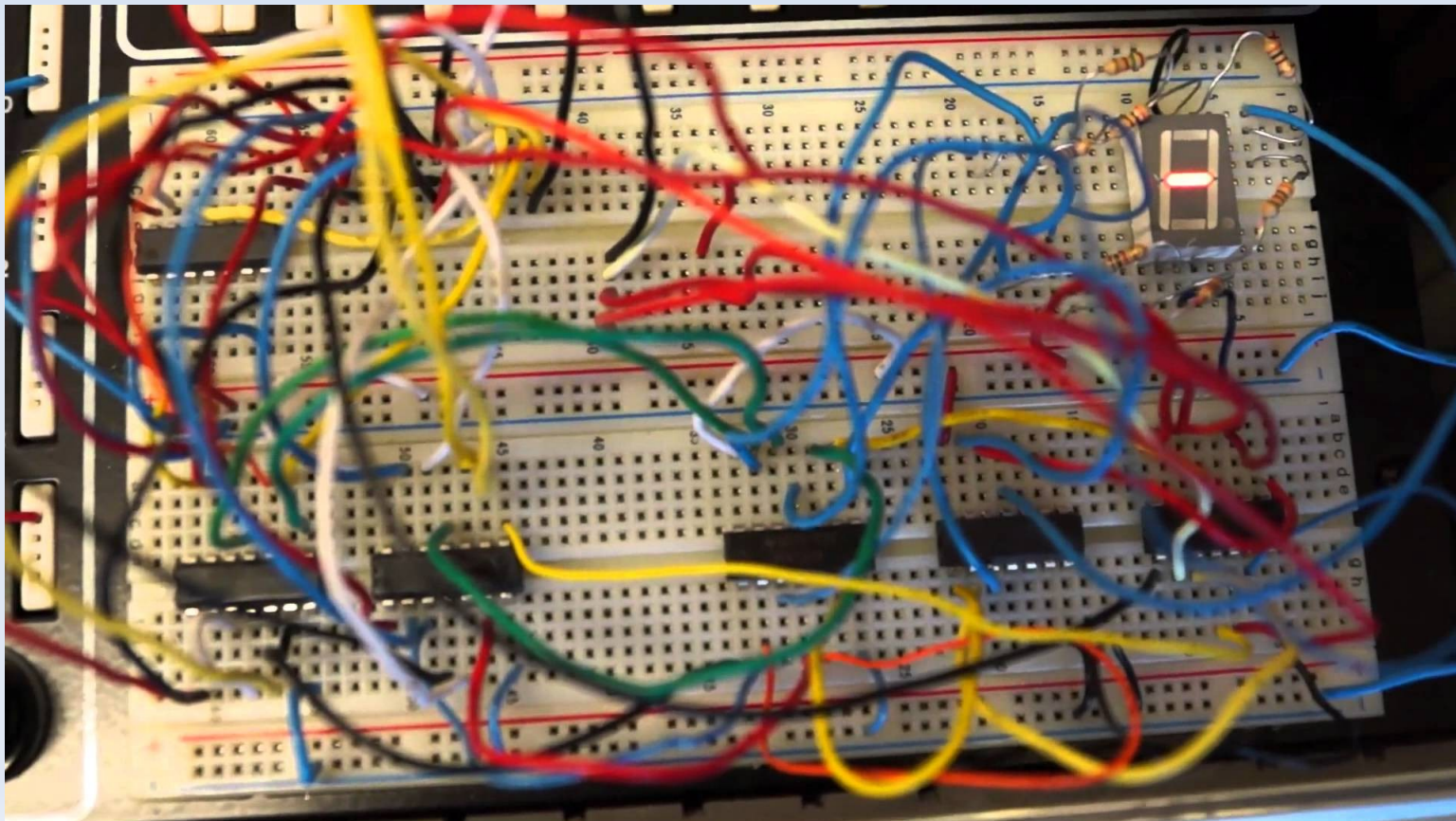 - AVR and Arduino (Insert More Arduino Jokes here)

Open Hardware Solutions

- Logic Analyzers

- Oscilloscopes

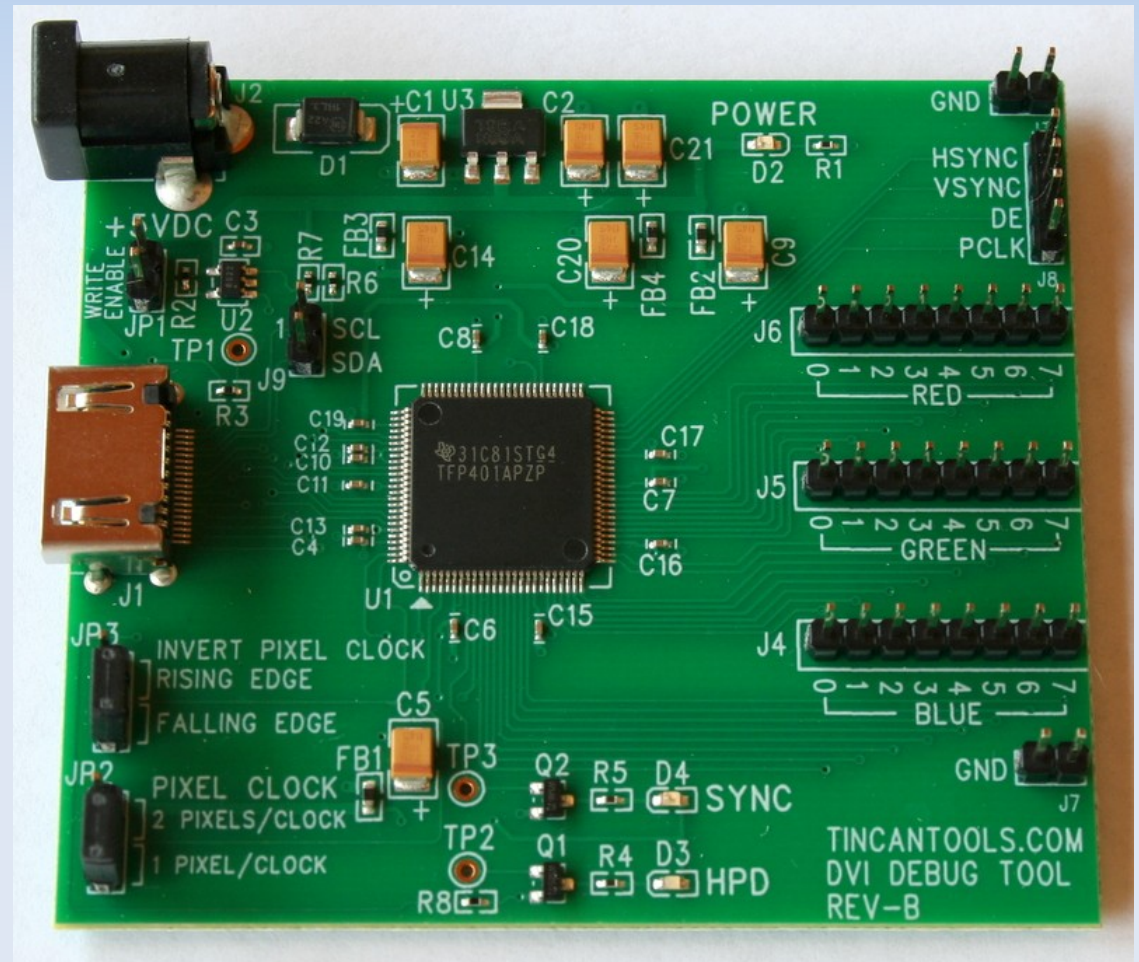 - Handhelds

  - AVR and Arduino

  - Kits

Open Hardware Solutions

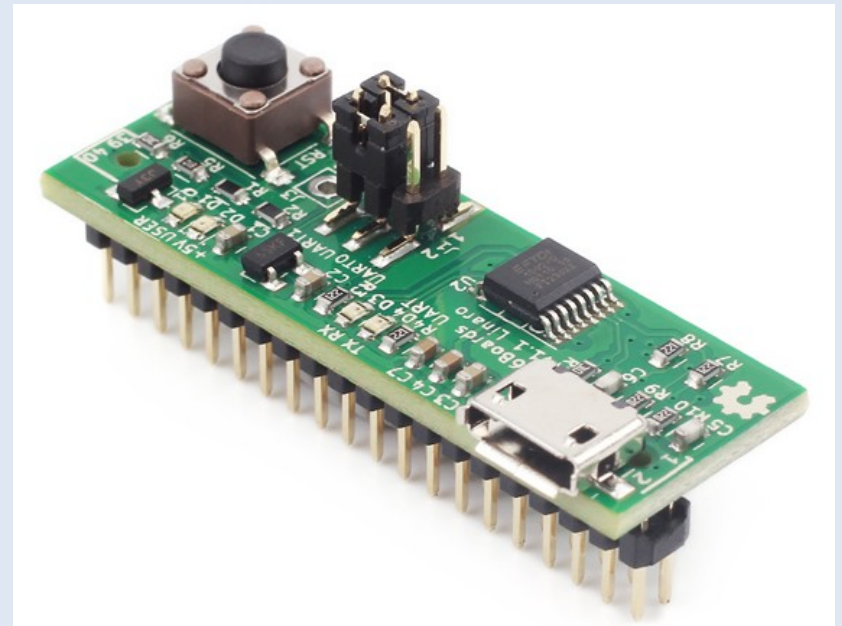- Logic Analyzers
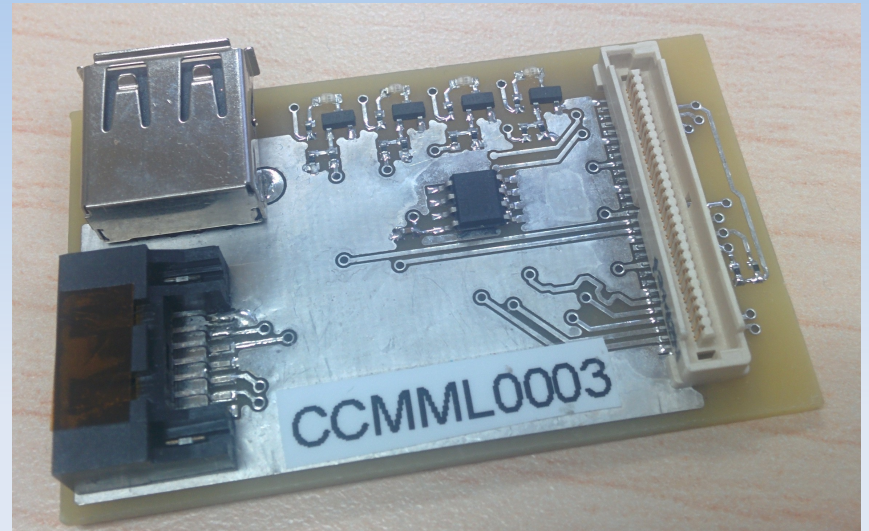- Oscilloscopes
- Custom Solutions

Open Hardware Solutions

- Logic Analyzers

- Oscilloscopes

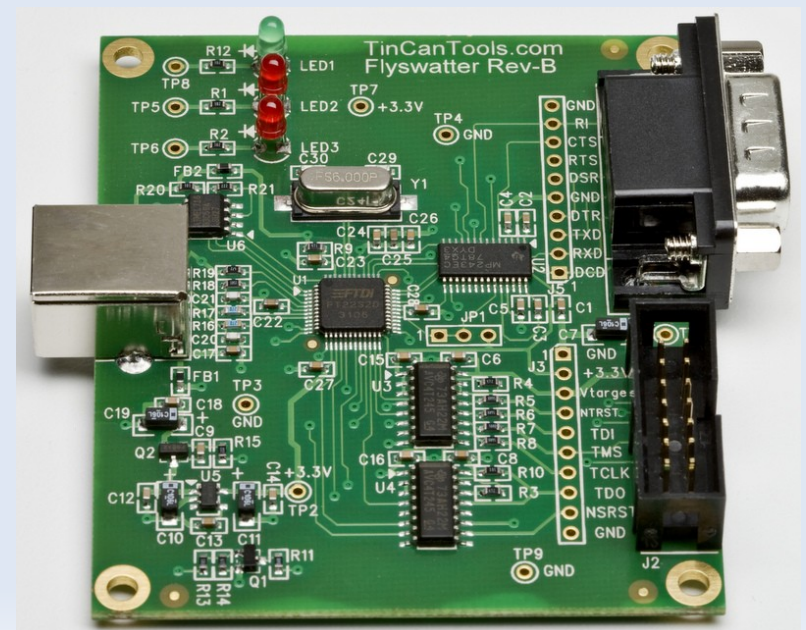- Custom Solutions

  - Bridge Solutions

Open Hardware Solutions

- Logic Analyzers

- Oscilloscopes

- Custom Solutions

  - Bridge Solutions

  - Common Interfaces

Open Hardware Solutions

- Logic Analyzers

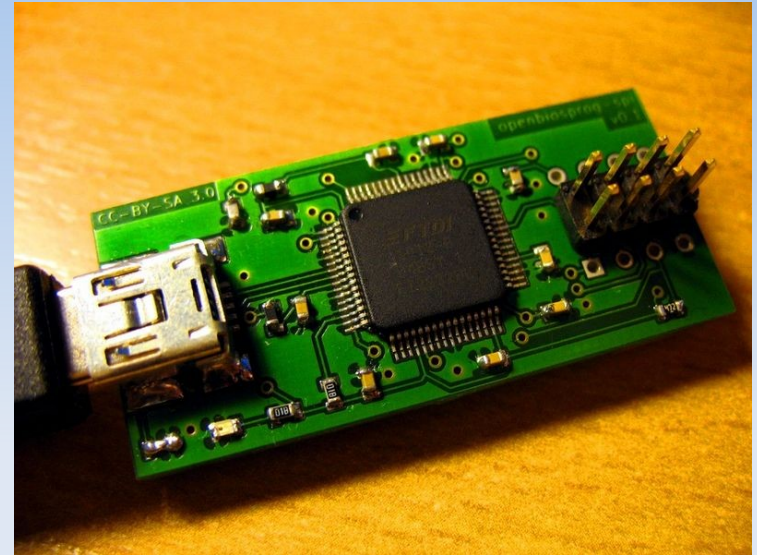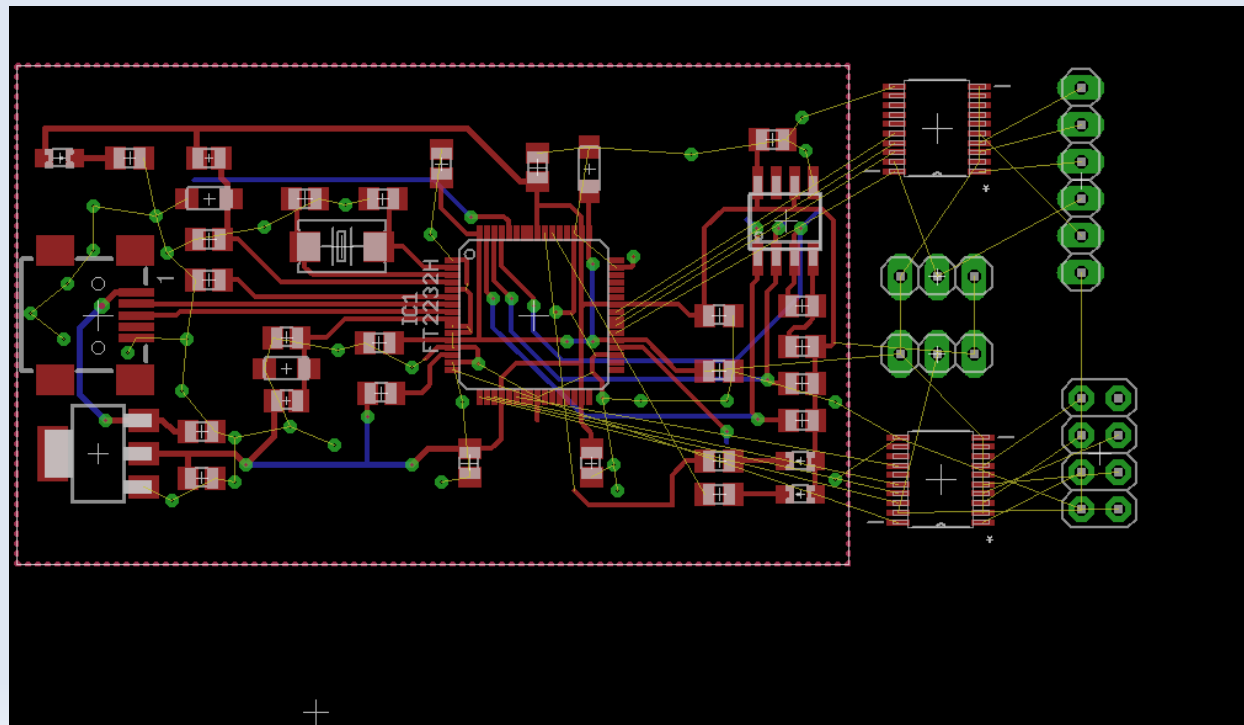- Oscilloscopes

- Custom Solutions

  - Bridge Solutions

  - Common Interfaces

  - Shared tool

    - Flashrom

    - Openocd

    - Sigrok

Open Hardware Solutions

- Logic Analyzers

- Oscilloscopes

- Custom Solutions

- Creating Your Own!

Open Hardware Solutions

- Logic Analyzers

- Oscilloscopes

- Custom Solutions

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  - KiCad

Open Hardware Solutions

- Logic Analyzers

- Oscilloscopes

- Custom Solutions

- Creating Your Own!
  - KiCad
  - Eagle CAD

Open Hardware Solutions

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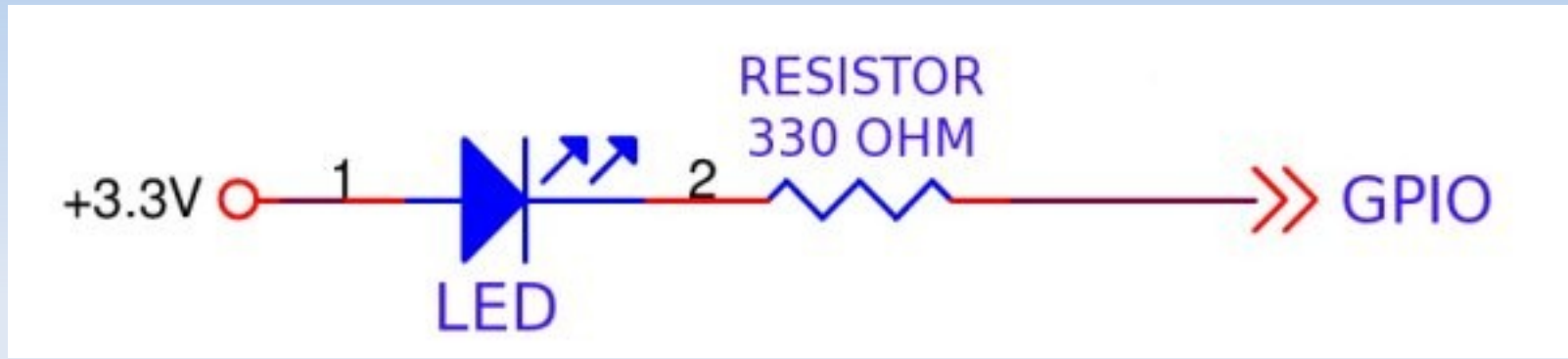
  - Eagle CAD

  - License it!

Challenges Going Forward

- Simple User Display

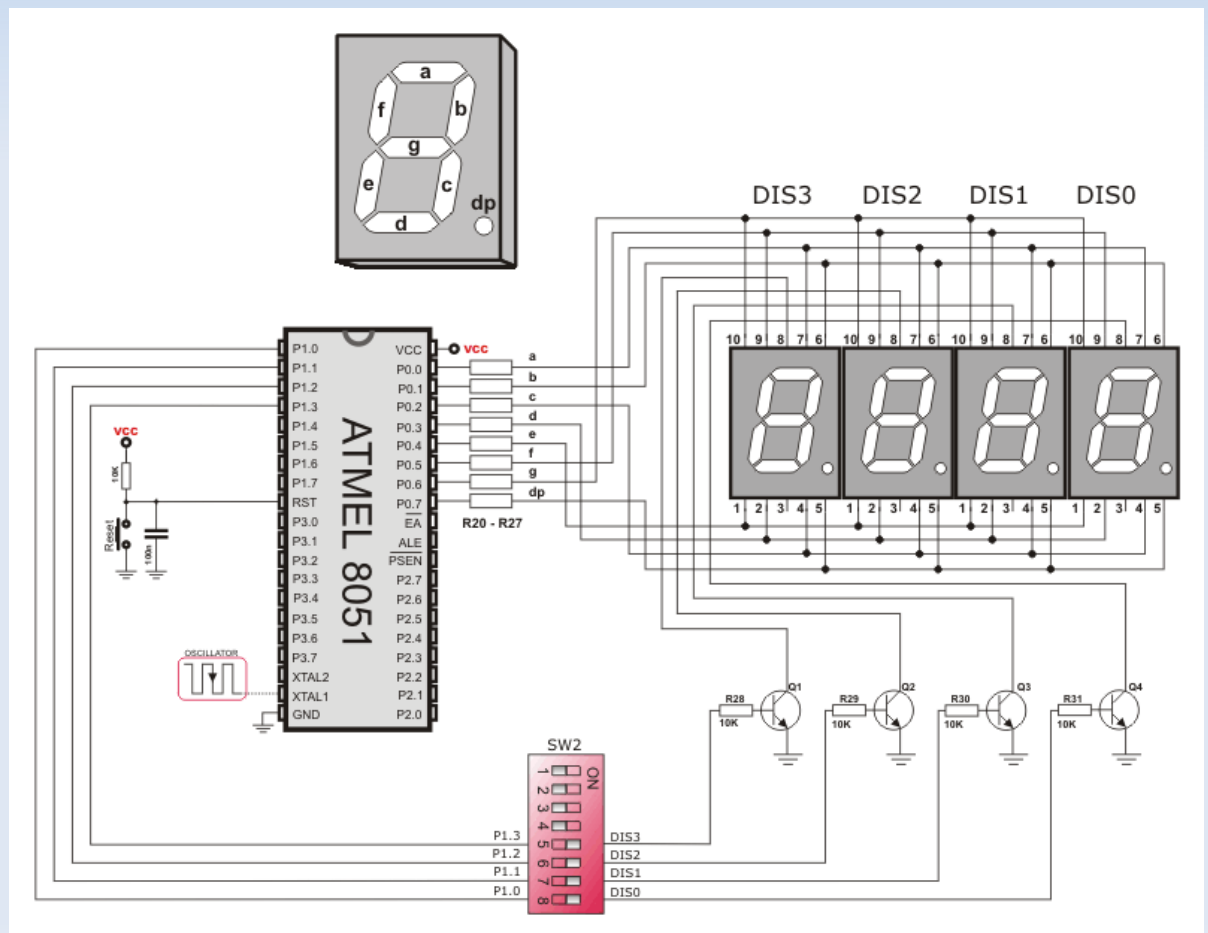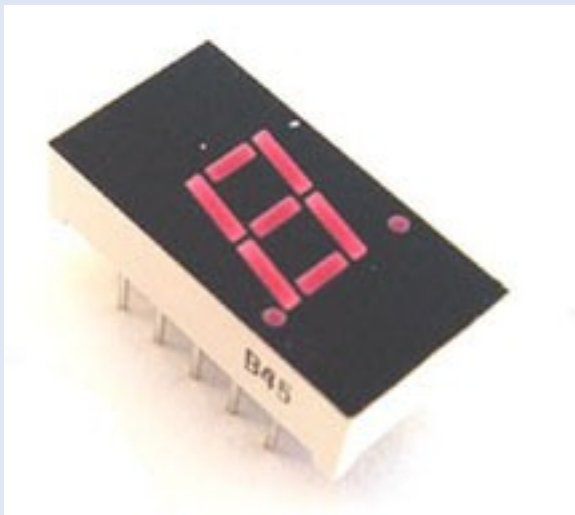# Challenges Going Forward

- Simple User Display

Challenges Going Forward

- Simple User Display
  - Easy to visualize
  - Easy to measure
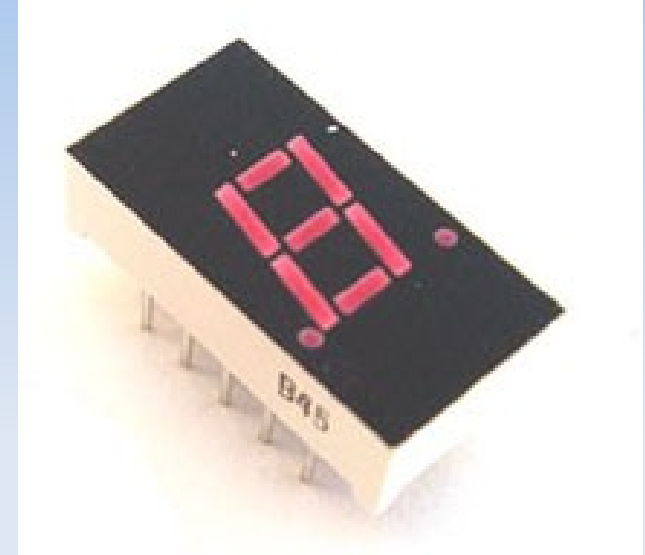 - Easy to program

Challenges Going Forward

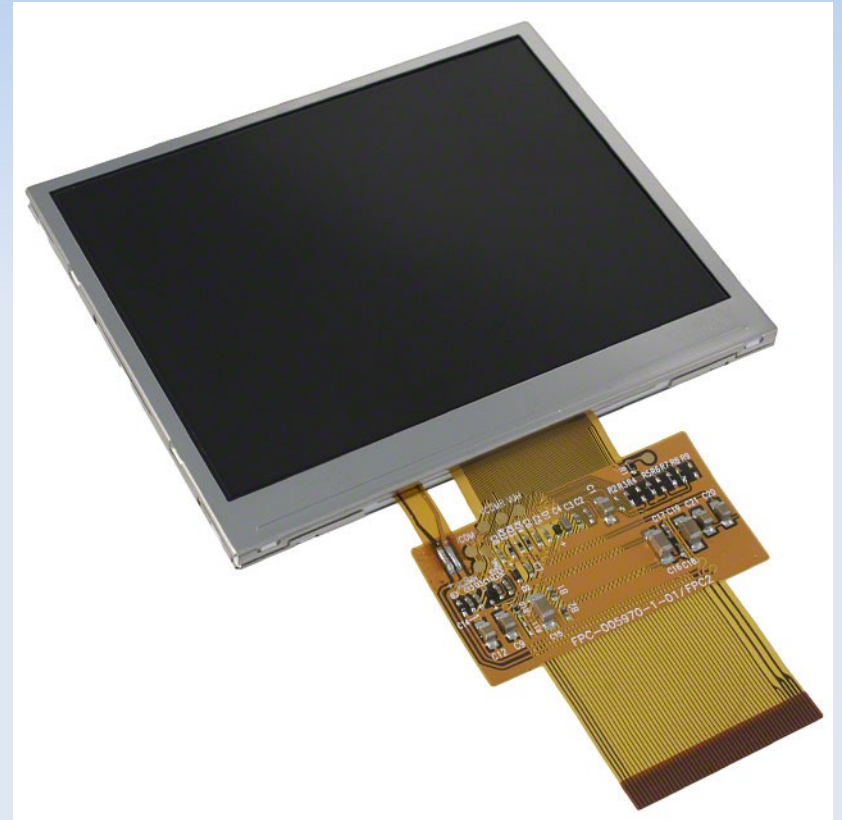- Simple User Display

- Evolution of Displays

Challenges Going Forward

- Simple User Display

- Evolution of Displays

    - Clocking

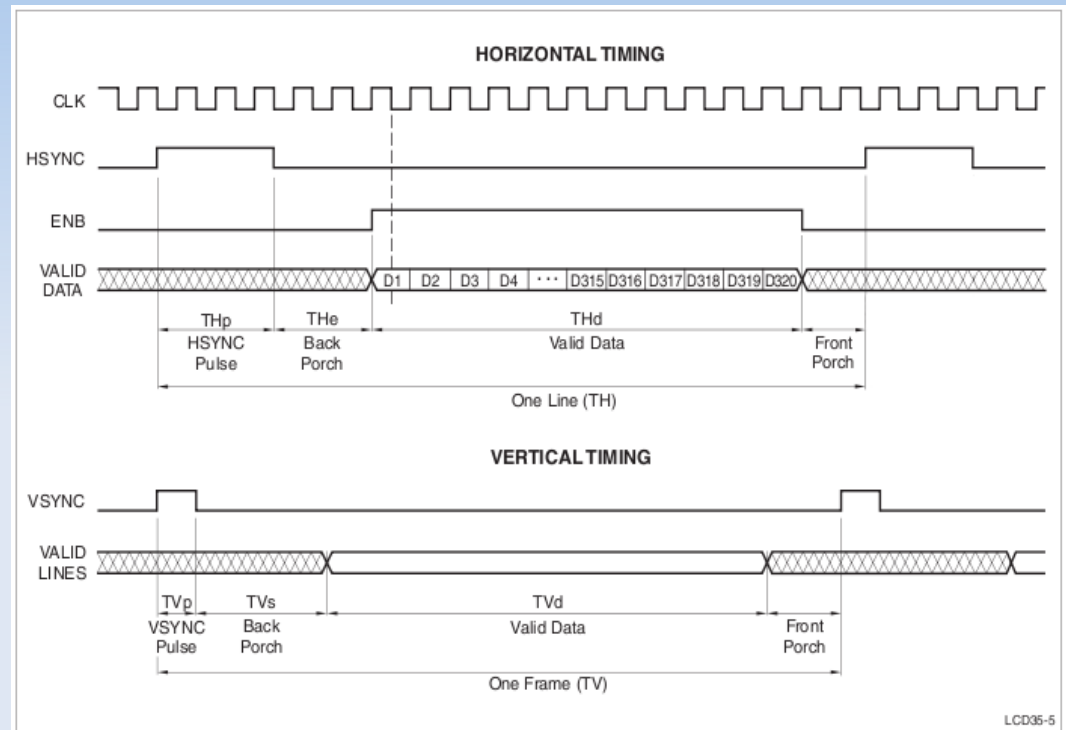   - Multiple signals

    - Introduction of controllers

Challenges Going Forward

- Simple User Display

- Evolution of Displays

- Transition to LCD

Challenges Going Forward

- Simple User Display

- Evolution of Displays

- Transition to LCD

  - Higher frequency

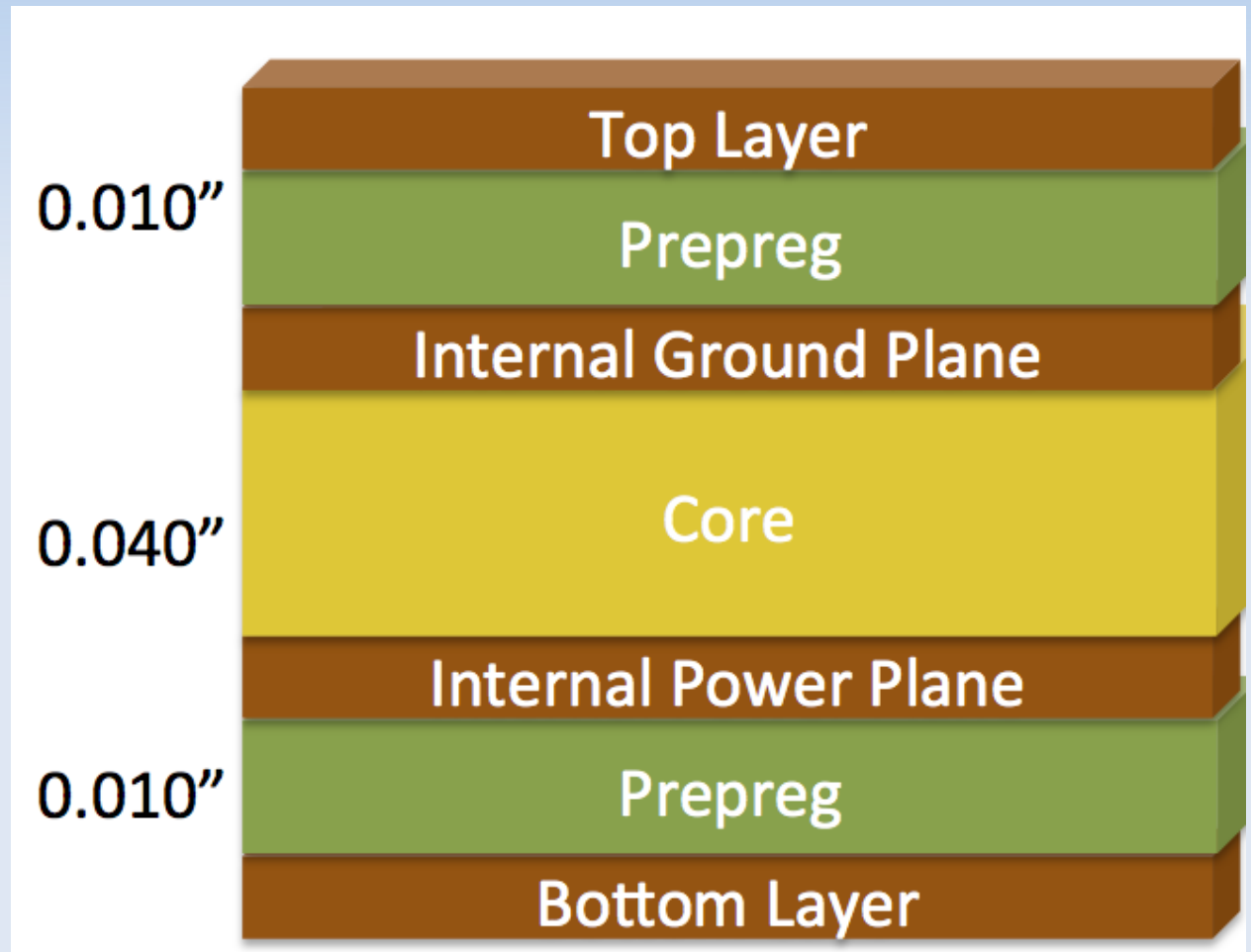 - More signals

  - Complex Controllers

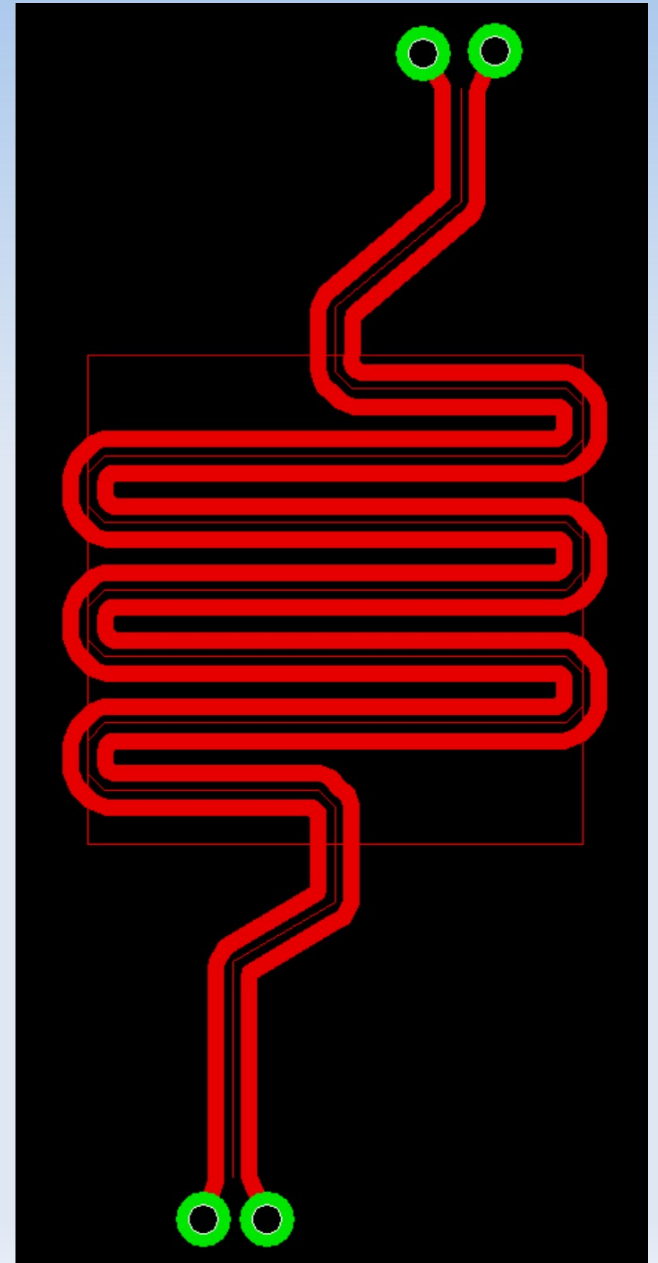# Challenges Going Forward

- Design Constraints

Challenges Going Forward

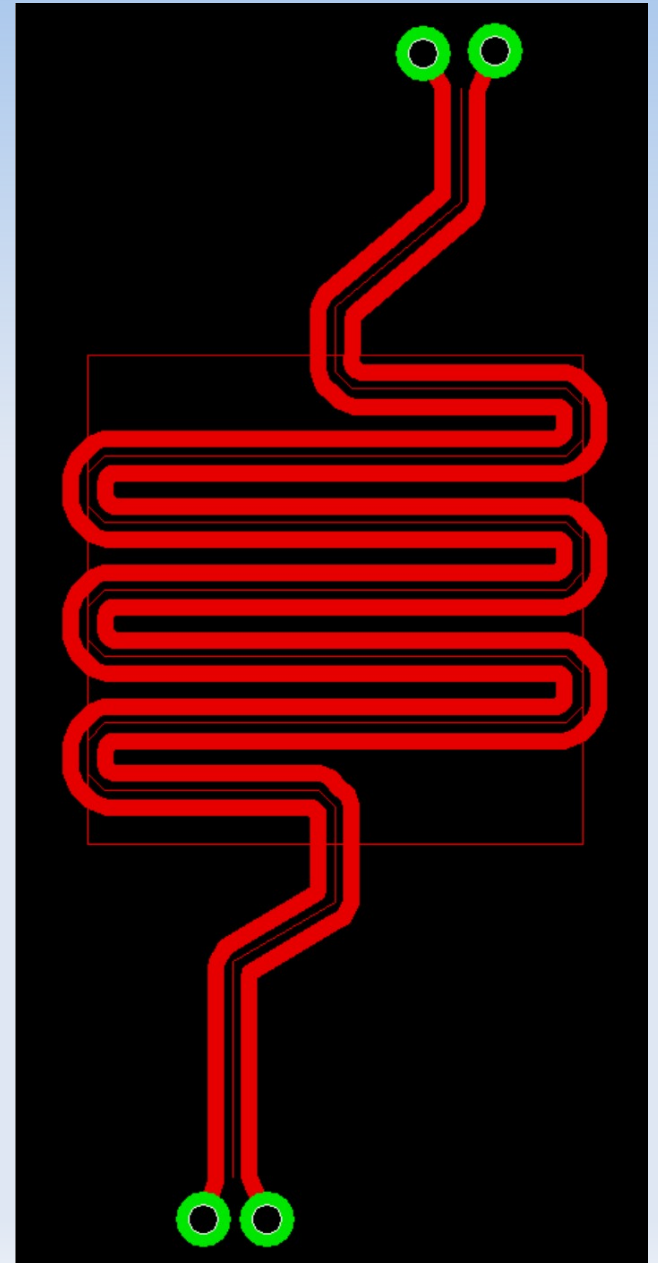- Design Constraints
  - Multi-Layer 4+

Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
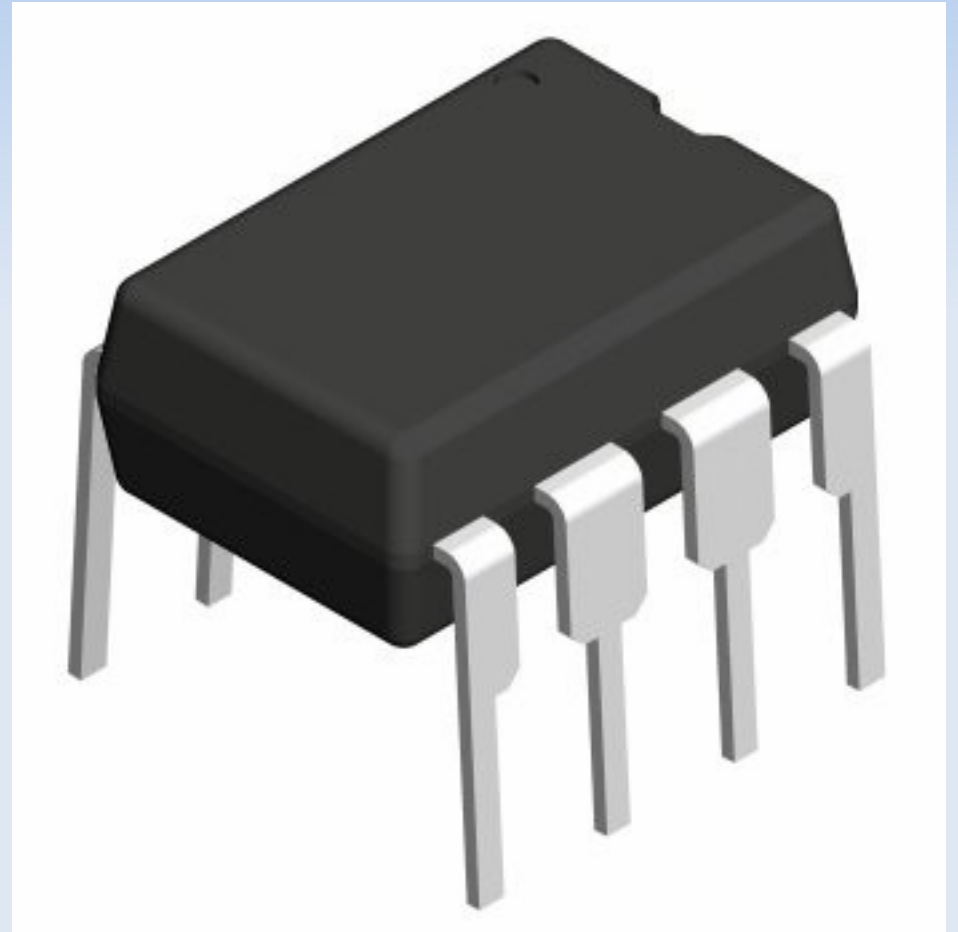 - Matched Lengths

Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
  - Matched Impedence

Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
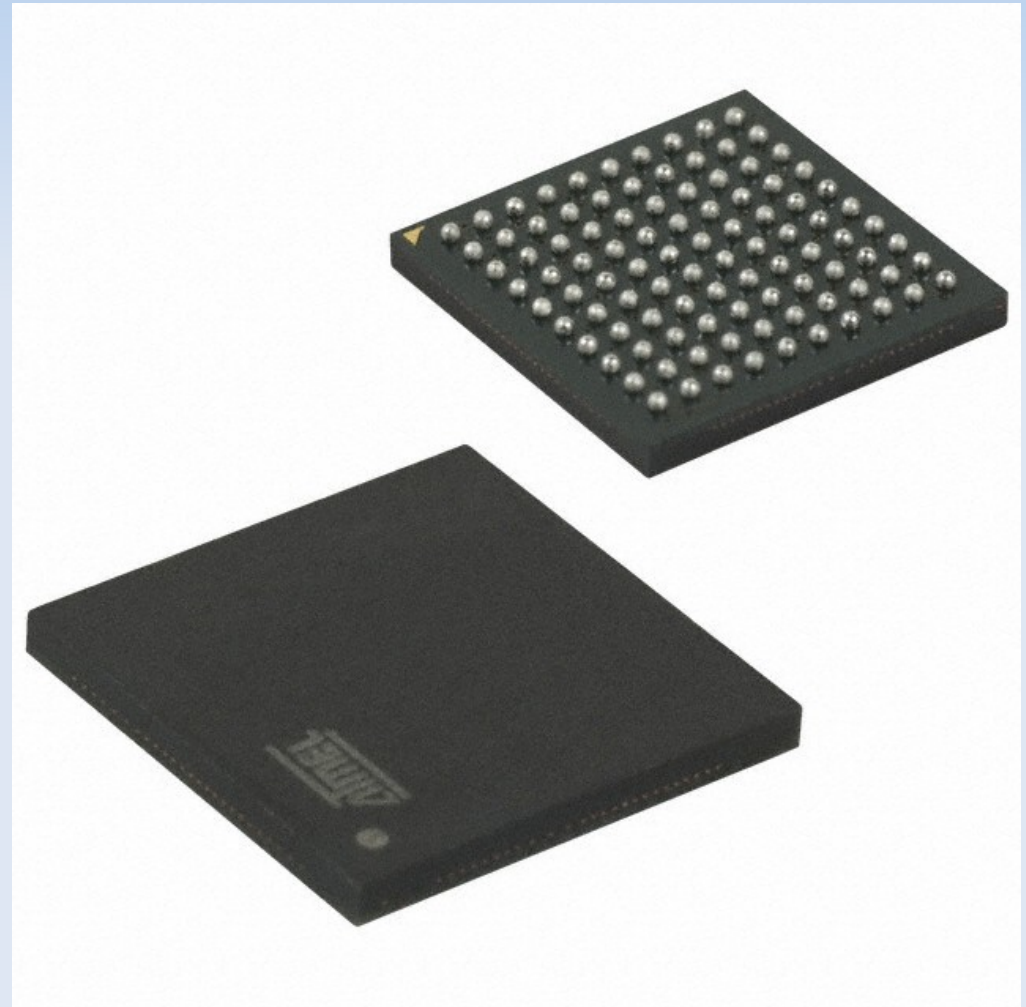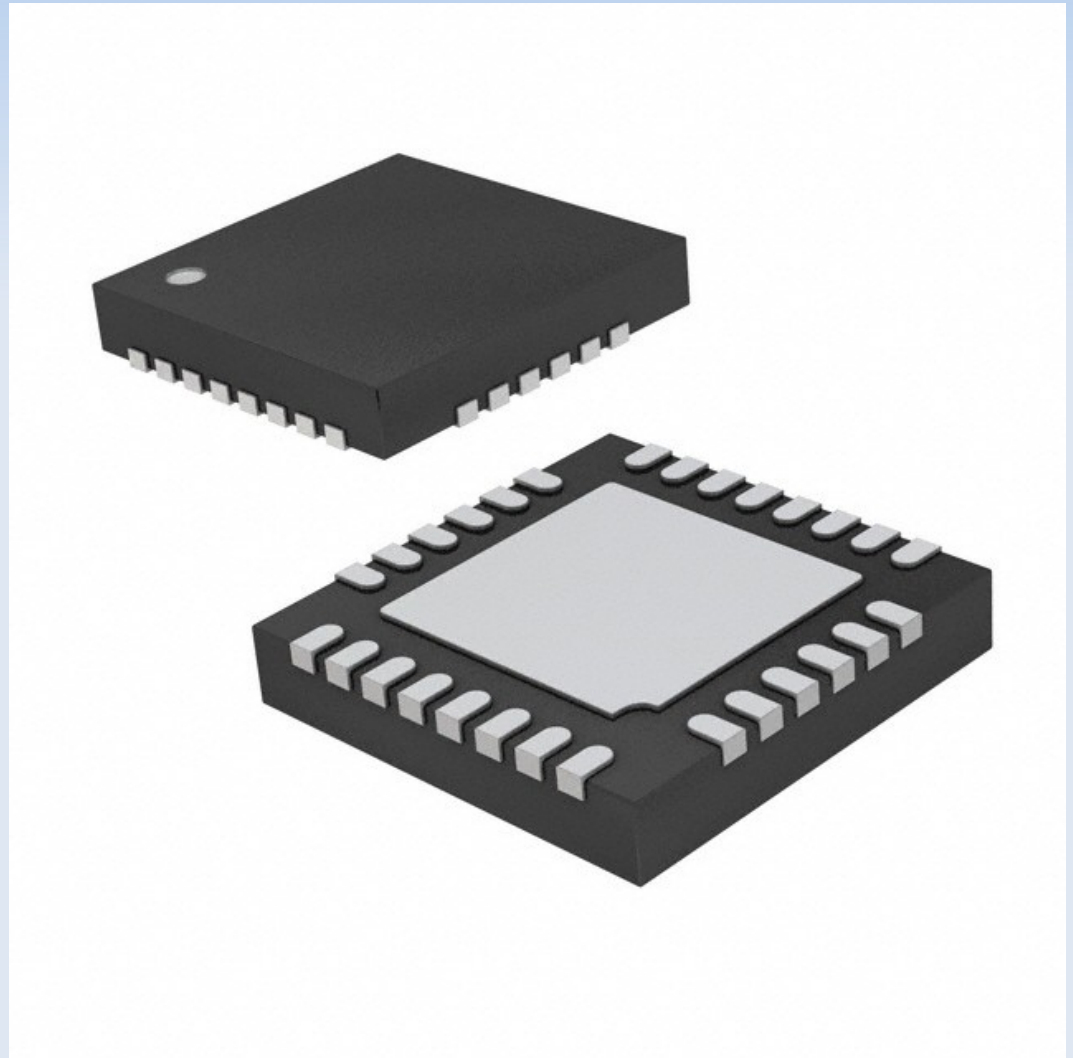 - Matched Impedence
  - Package type

Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
  - Matched Impedence
  - Package type
    - BGA

Challenges Going Forward

- Design Constraints
  - Multi-Layer 4+
  - Matched Lengths
  - Matched Impedence
  - Package type
    - BGA
    - QFN

Challenges Going Forward

- Design Constraints

- Differential Pairs

Challenges Going Forward

- Design Constraints

- Differential Pairs

  - PCIe/mPCIe

PCI-Express x1 Connector

x1   x4   x8   x16
Graphics only

Types of PCI-Express connectors

Mini PCI EXpress
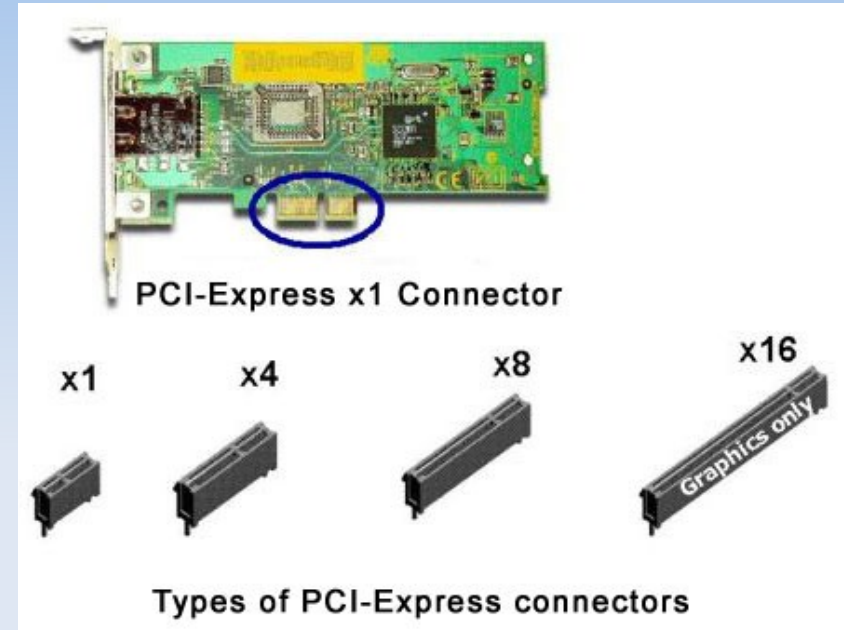
Challenges Going Forward

- Design Constraints

- Differential Pairs
  - PCIe/mPCIe
  - SATA/mSATA

Challenges Going Forward

- Design Constraints

- Differential Pairs

  - PCIe/mPCIe

  - SATA/mSATA

  - HDMI/DisplayPort

Challenges Going Forward

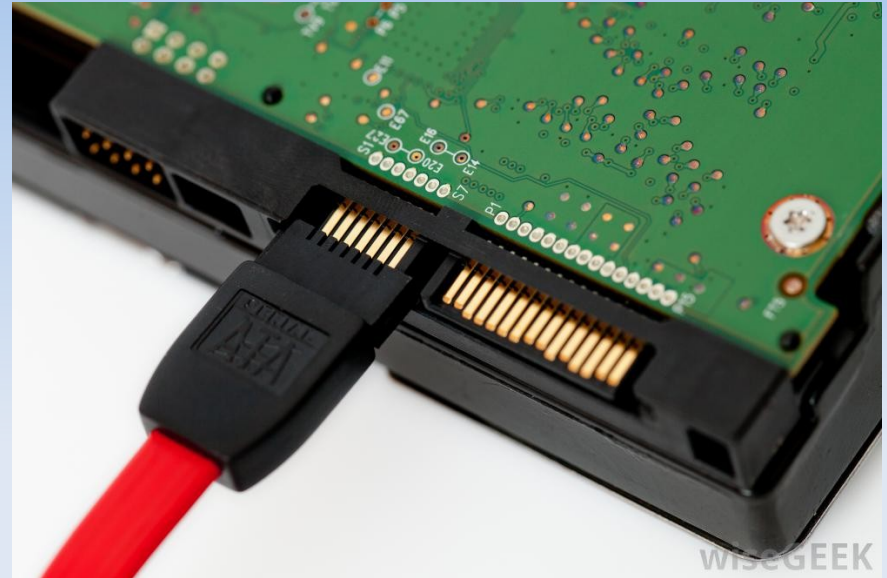**Are FPGA based implemenations the solution?**
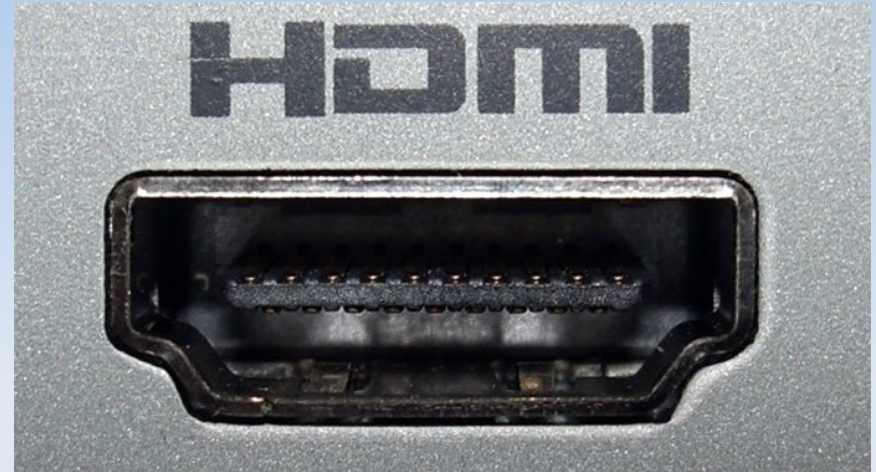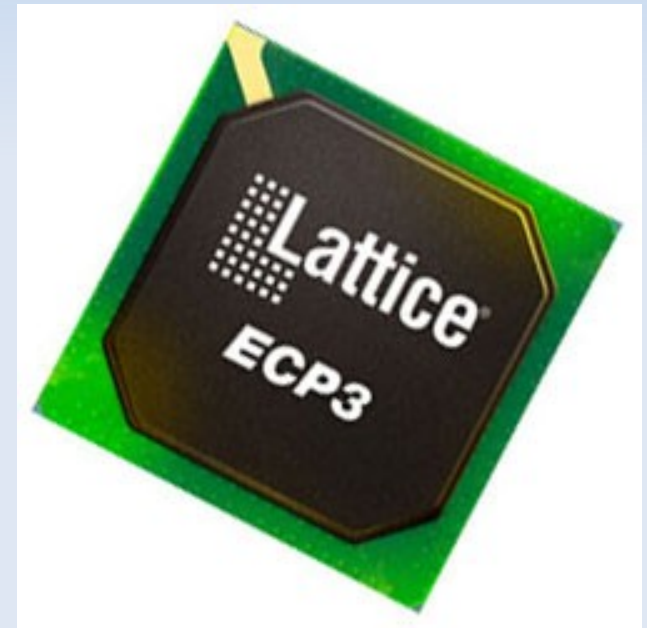
Challenges Going Forward

- Design Constraints

- Differential Pairs

- Documentation/Licenses

Challenges Going Forward

- Design Constraints

- Differential Pairs

- Documentation/Licenses

    - Closed or NDA Documents

Challenges Going Forward

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Challenges Going Forward

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  - Restrictive License

  - DRM

Conclusion

- Long History of Open Tools (Past)

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- Long History of Open Tools (Past)
- Creating New Open Hardware Tools (Present)

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- Long History of Open Tools (Past)

- Creating New Open Hardware Tools (Present)

- Challenges Ahead (Future)

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- Incentive to create Open Hardware Tools

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- Incentive to create Open Hardware Tools

- Incentive to use Open Hardware Tools

- Documentation

  http://www.elinux.org/Open_tools

Conclusion

Questions?